

A MULTIDIMENSIONAL ICT- MEDIATED PROJECT ON TEACHER TRAINING AND ENVIRONMENTAL SUSTAINABILITY IN EXPERIMENTAL SCHOOLS IN GREECE

Maria Gkountouma
Environmental Education Center, Makrinita

Maria Kouklatzidou,
3rd Experimental School of Evosmos

Greece

Abstract

This paper presents a 4-year project, including an online teacher-training course, the creation of school-gardens across Greece, publications and the application of ICT tools in teaching for sustainability. The project aims at bringing together the physical and the digital world in educational settings and making learning fascinating via online courses and communities, ICT tools, augmented-reality and hands-on environmental awareness projects at schools as well as printed and e-publications. It is embraced by its participants, teachers and pupils, and has received merit on a EU Teachers' Contest. Currently, the 5th stage of the project is piloted and will be implemented soon.

Introduction

Current high-tech knowledge-based society has made lifelong learning a prerequisite of the contemporary global market. Similarly, new technologies have infiltrated all aspects of human activity, including education, thus setting new paradigms. Teachers need lifelong training to remain up-to-date, avoid professional downgrading and develop their social skills (Gkountouma, 2014). Also, they need to combine the physical and the digital world creatively to make teaching attractive for their students. Along with these challenges, they need to work with United Nations' Sustainable Development Goals 2030 and participate in a global call for environmental awareness and sustainability.

In Greece, teachers' training is mostly initiated by them and can be accessed via attending courses provided by private institutions or universities at a cost, Massive Open Online Courses (MOOCs) and trainings organized by the Greek Ministry of Education. The latter teacher-trainings are not systematic; they lack continuity and organized planning, whilst the places available are limited, and the topics are often repetitive or non-representative of the teachers' needs. As to teacher-trainings on Information Communication Technologies (ICT), though an extended public program has been implemented, seat availability is limited, the content often becomes obsolete, and, due to funding restrictions, official certification is not always available.

Environmental Education Centres (EEC) are the main public teacher-training providers on environmental awareness topics, but their work is also segmental due to budget restrictions and staff cuts whilst other limitations such as red

tape and rigid policy adherence do not allow massive teacher-trainings. In addition, though there is a wide variety of ICT tools employed in Environmental Education (EE) projects at schools, EECs greatly oppose the use of ICT on environmental projects, and, also, there is a lack of systematic research on the way ICT is used and contributes to raising environmental awareness (Fauville, Lantz-Andersson, & Säljö, 2014).

In this context, the project presented in this paper was designed and implemented. It is a multidimensional 4-year project, currently piloting its 5th stage. In detail, it started with a facilitated-led e-learning teacher-training course on EE and school gardening, addressed towards educators in Experimental Schools around Greece. In its 2nd stage, participants created school-gardens all over the country, monitored their progress and outcomes and self-evaluated how they implemented what they had learned in the course. Materials of this stage were uploaded on an online community of practice, where participants shared their experiences, ideas and tips. On the next 2 stages, the course's facilitators published a *Handbook on School Gardens: A Distance Teacher Training Course* (2015) whilst the participants are currently preparing for publication an *Activity Book: A Guide to School Gardening* (2017). Soon, the project will enter its final stage, which involves an augmented reality application on outdoor environmental activities, thus making a full circle of the goals set for this project: teacher-training, bridging the gap between the digital and the physical world, raising environmental awareness and making learning fun.

Literature Review

During the design and analysis of the project, consideration had to be taken into account as to what the project can add to the existing literature and what can it really offer to all stakeholders. Thus, besides an initial call of interest and a needs analysis of the teachers willing to participate in the project, there was a literature review that helped towards understanding the needs of the stakeholders, defining the goals of the project and selecting the tools used.

The Professional Development of Teachers

Among other factors, swift changes in the job market and the limitation of jobs due to technological advances and skills mismatch, have made lifelong training an imperative for every person wishing to pursue a career or even just maintain his/her current job post. Lifelong learning programs not only certify skills' acquisition but also provide feasible job opportunities (Kelpanidis & Vrynioti, 2012). A look at classic theories of participation would also add that people participate in lifelong learning programs because they wish to satisfy inner needs of self-esteem, self-actualization and an intrinsic urge towards constant learning (Houle, 1961; Maslow, 1947), social needs of belonging (Miller, 1967) or other needs such as financial gain (Rubenson, 2007).

However, to deliver a program, tailored to participants' needs, the barriers to participation must be examined, as well. So, in the needs analysis stage of the project, barriers to participation were also explored based on Cross's (1981) Chain-of-Response model. This model explores situational, dispositional and institutional barriers that inhibit adult participation in lifelong training whilst

considering access to information about learning opportunities, attitudes about education and life transitions. What is interesting, as Cross (1981, p. 97) suggests, is that “motives differ for different groups of learners, at different stages of life, and most individuals have not one but multiple reasons for learning”, which can be applied to teachers attending lifelong training and to students in formal education settings.

Distance Teacher Training Courses

Online, asynchronous lifelong learning programs have met the needs of busy adults and vastly changed education deliverance by placing ICT in the centre of education, changing teaching practices and learning habits and creating a more active, engaging, participatory setting for all stakeholders (Gkountouma & Kouklatzidou, 2013). The availability of Learning Management Systems (LMS), embedding Web 2.0 tools, forums and chat rooms, has broken down time and space by bringing traditional elements of the education process into a digital space (Arbaugh & Benbunan-Fich, 2007). User interaction, peer work, feedback, project-based and inquiry-based learning build up a set of skills that not only enhance participants’ learning and teaching profiles, but also reshape their identity (Chatzisavvidis & Alexiou, 2012).

ICT in Education

ICT integration in education has gradually become a standard practice in most schools in countries in the European Union and other developed countries. Web 2.0 tools have created a new teaching and learning paradigm by promoting user interaction and collaboration, shifting participants’ roles from passive students to active, critical content makers and delivering personalized learning (Jimoyiannis, 2010; McLoughlin & Lee, 2010; Redecker, 2009). Similarly, digital storytelling offers authentic educational environments where students re-evaluate their learning strategies, acquire new roles and re-shape their identities (Coventry, 2008). Even video games are now considered powerful learning tools, as they promote user participation, communication and collaboration on complex tasks that boost various skills whilst incorporating many educational principles (Gee, 2003; Prensky, 2001).

Though ICT integration in education has gone a long way over the past two decades, its pedagogical use is still dependent on various personal, institutional and technological factors (Buabeng-Andoh, 2012). It must be noted that teachers often lack skills, confidence, time or willingness to embed ICT tools in their practices. In the meantime, there is a lack of high-tech up-to-date equipment in Greek schools to meet the demands of 25-30 students at a time whilst occasionally headmasters, parents or even students are unprepared to accept alternative practices of learning, collaborating and being evaluated.

Environmental Education and ICT

EE is now considered the primary instrument of promoting the United Nations’ Sustainable Development Goals and creating generations of people who will make informed decisions regarding the sustainability of the planet and the human race. Similarly, since technology has infiltrated all aspects of human activity, its integration into the curriculum is not limited to the traditional school subjects but extends to every school activity, including

interdisciplinary EE projects (Willis & Weiser, 2005). The Internet and Web 2.0 tools are extensively used mostly in the initial stage of EE projects when students are searching and collecting information and in the final stage when the project is presented. Google search, wikis, website design, videos, Prezi and PowerPoint presentations, Google maps, digital storytelling software are just some of the tools employed (Payne, 2003). Still, nowadays, EE is becoming even more enriched with interactive kiosks, geospatial technologies, videoconferencing, drone coverage, virtual learning environments, simulation games and augmented reality applications. Most of them are collaborative, promote soft skills, enhance motivation and enthusiasm and help students understand both the physical and the digital world, by making comparisons, combining them and, in the end, standing critically towards both (Carvalho de Sousa, Sevilla-Pavon, & Seiz-Ortiz, 2012). Of course, such a development does not come without problems. Many teachers as well as the staff of EECs feel concerned and resist ICT integration in EE either because they lack education technology preparation or because they feel that ICT destroys the natural real-life experience when taking EE outdoors (Aivazidis, Lazaridou & Gustav, 2006; Willis, Weiser & Smith, 2016).

Description of the Project

To bring together the physical and the digital world whilst teaching about ICT and environmental awareness, along with other school subjects, a project on ICT and school gardens was designed and implemented. The designers and facilitators of the distance-training course had been experimenting with ICT in EE for a few years before designing this project, so instead of a pilot they chose to bring together their experiences and user-feedback. The project began during the 2014-2015 school year and was addressed towards teachers working in Experimental Schools around Greece, who were interested in creating a school garden.

Aims and Objectives

Most of the aims and objectives for each stage of this project derived from discussions with interested teachers, filling-in online surveys and needs-assessment questionnaires, etc. Many of the goals changed during the project; new ones were added. The overall aims of the project were to facilitate teacher-participants and, in the long run, their students towards becoming accustomed to using ICT in EE projects at school, learning how to create and sustain a school garden, designing learning scenarios and employing various means of cognitive interaction and learning. In addition, participants were expected to gain new skills or enhance their pre-existing sets of skills on identifying and working around hot environmental issues, participate in learning communities, both online and offline, manage and organize their time and resources effectively and practice on using ICT tools and working in virtual environments. Finally, participants were expected to gain awareness of global environment issues and sustainability, acquire a more sensitive set of values towards environmental protection, realize that learning is a dynamic, collaborative process and embrace ICT and our era's technological advances.

Training on ICT and Gardening

Some project aspects required specialized knowledge and skills, e.g., knowing how to grow a garden, how to use new software and applications, etc. To meet these demands all stakeholders made use of their academic knowledge, non-formal learning and work experience. Also, external experts, such as agriculturists, municipality workers, information technology technicians, etc., were called upon to provide guidance, advice or manual labour.

Facilitators. In order to design the entire project the facilitators combined their academic knowledge and degrees in ICT in Education, Adult Education, Pedagogy and Communication for Development with their hands-on work experience at schools and the Environmental Education Centre.

Teachers-participants. All the teachers-participants in the project had experience working with EE projects at schools, though most of them had never grown a school-garden before. As to their ICT skills, all of them had acquired a State Certificate in ICT, level A (MS Office), and some of them had a State Certificate in ICT in Education, Level B or similar qualifications. So, though they were not accustomed to using ICT in EE projects, they had employed ICT in their teaching practices before and were not beginners.

Students-participants. As students were also involved in the project, most of the ICT skills needed were gained during the ICT subject at school whilst the gardens were grown during a flexible teaching zone added in the curriculum.

Profile of the Teachers - Participants

As mentioned before, the project was addressed towards teachers working in Experimental Schools, both primary and secondary, across Greece. Experimental Schools were chosen because they represent a unique type of public school, highly challenging and competitive but also open to new practices, partnerships and researches. The teachers employed in these schools are selected on a competitive basis and work on a seconded job post for five years, which allows projects to unfold and expand on a full scale. During the first stage of the project, 27 teachers from all over Greece were enrolled, but after the second stage 4 left the project because they quit working in Experimental Schools in Rhodes and Patras, which was a prerequisite. Out of the 24 participants, 19 were female, and only 4 were male. The group consisted of 13 primary school teachers, 3 physical education teachers, 2 kindergarten teachers, a music teacher, an art teacher, an English language teacher, a mathematician and a religious studies teacher. In terms of geographic distribution, the appointed teachers were in schools in Thessaloniki, Athens, Ioannina and Alexandroupoli. During the next stages of the project, other teachers expressed interest in joining. Therefore, even though they missed out on the e-course, they read the material, found support in the community and joined the project.

Stages of the Project

The project started during the school year 2014-2015 and consists of five stages. In detail, it started with an online teacher-training course on EE and school gardening. In its 2nd stage, participants were asked to create school-

gardens all over the country, monitor their progress and outcomes, and self-evaluate how they implemented what they had learned so far. Materials of this stage were uploaded on an online community of practice, where participants/educators shared their experiences, exchanged ideas and tips. In the next two stages, the course's facilitators published a *Handbook on School Gardens: A Distance Teacher Training Course* (2015), whilst the participants are currently preparing for publication an *Activity Book: A Guide to School Gardening* (2017). Next school year, the project will enter its final stage, which involves an augmented reality application on school gardening, currently designed and piloted.

Stage 1. Distance teacher training course. The idea of designing and implementing a course on school gardening was not new to the facilitators. However, to prepare for it they conducted an online survey to find out whether there was interest in it and exactly what teachers would like to learn. The answers formed the course's content and structure. It lasted 25 hours (reading and chatting time only) and was implemented within 7 weeks via the free LMS Open e-class, supported by the Greek Universities Network (GUnet).

The course modules were:

- Week 1. Historical background -- Theoretical background of school gardening
- Week 2. A proposal: Its formation, logistics and other considerations
- Week 3. Design, growth and sustainability issues
- Week 4. Selecting crops -- Vegetables and herbs
- Week 5. Activities in the school-garden
- Week 6. Activities around and about the school-garden
- Week 7. Discussion, dissemination, evaluation

Every week, participants were requested to complete compulsory and optional group and individual tasks (e.g., multiple choice quizzes, lesson plans, participation in a forum problem-solving activities, etc.). By the end of the course, the teachers had created a useful database of lesson plans and scenarios and a well-organized community forum, which included many topics and further ideas. The course was evaluated via an online questionnaire, which explored the teachers' motives of participation in the course, their opinion about its design and content and optional open-ended feedback.

Stage 2. School gardens. During this stage of the project, teachers were expected to plan and grow a school-garden with their students. Some started it during the online course, to have side-by-side theory and practice whereas others started it after the end of the course. Teachers used the lessons plans and scenarios created during the first stage, employed techniques they had learned so far and collaborated with experts they met during the course, to bring the school closer to the neighbourhood, the parents' association, some universities and the job market. Most of the teachers also joined a National Thematic Network on Herbs (<http://mvotana.weebly.com/>), developed and sustained by one of the facilitators, Maria Gkountouma. Via the network,

teachers received support, retrieved academic and other material (flashcards, picture dictionaries, etc.) and showcased their work whilst they visited the EEC and implemented outdoor programs on herbs with the staff.

Stage 3. Handbook on delivering a distance teacher training course on school gardening. Meeting the requests of the teachers-participants but also other teachers of the National Thematic Network on Herbs who were not allowed to take part in the course, the projects' facilitators wrote a *Handbook on School Gardens: A Distance Teacher-Training Course* (2015), which in eleven chapters presents all the core-material used during the course and contains an appendix with activities, reflection questions, evaluation tasks etc. The e-Handbook is Open Accessed, under Creative Commons Licence, so it may be retrieved and used by all interested teachers and other stakeholders.

Stage 4. ICT-mediated teaching scenarios on herbs and plants, for primary and secondary education. To disseminate the community's activities and practical experience, interested teachers responded to a call for the *Activity Book: A Guide to School-Gardening* (2017). In 200 pages, 19 teachers shared their ideas on how to approach EE in an interdisciplinary way and combine ICT and the digital world with physical outdoor activities. Teachers and their students, designed and maintained websites, wikis, blogs and social media pages on EE, collected their work on Google Drive, Dropbox and Blendspace, created digital stories and comics via Storybird, Comic strip creator and Movie Maker, video-recorded recipes, made e-flashcards, combined environmental and physical education and music from YouTube with folk culture, played an interactive "Who wants to be a millionaire?" self-made game, created an interactive map of herbs found in the Greek countryside via Google maps and even used the Bee-Bot programmable floor robot to learn about art and EE.

Stage 5. Taking learning outdoors via augmented-reality applications. Inspired by the frenzy over Pokémon Go and its infiltration in younger people, the facilitators are currently piloting a real-world treasure hunt via the mobile application *Action Bound*, which is for playing digitally interactive scavenger hunts. With the use of GPS coordinates and pre-placed QR codes, a scenario following a timeline of events will invite participants to follow directions, investigate clues, check out photos and videos and solve mystery quizzes, to achieve a final goal. The app is currently used in the outdoor setting where the EEC is located, and, as of next school year, it will be available to teachers and students visiting the EEC. Still, the aspiration is to train and inspire the teachers of this project and the members of the Thematic Network on how to use the app in any given settings, by making minor adjustments, mostly around the GPS coordinates and the QR codes' physical location.

Discussion

When participants entered the project by attending the online course, they mentioned that their motives were mainly focused around their professional development and their personal interest in gardening. Still, as soon as they realized that the project was more open and not confined to attending an online course and delivering a project (a school-garden) they got

enthusiastically engaged in it. What happened, in their own words, was that they found a safe space and willing people with whom they could have a continuous, well-designed collaboration and alongside make unexpected friends. Evidently, there are a lot of eager and creative professionals in education who would like to have a more stable, organized network of colleagues, whom they could summon immediately when they want to propose new ideas and projects and find direct and fast responses.

So, in this context, participants started taking initiatives for further actions, events, partnerships, etc. As the project progressed, new needs arose, new ideas were proposed, so its structure, length and profile changed; more people wanted to join, outside Experimental Schools, so handbooks had to be published for their support, and a larger database of ideas and material needed to be created. As it turns out, though currently the project is in its last stage, core and peripheral participants keep sustaining previous stages, by repeating them with new students, enhancing them or disseminating parts of them. Currently, it could be argued that the project is not acknowledged and certified, in the sense that newcomers can't actually attend the online course and receive a certificate for it. Still, participant certification and guided facilitation are not goals or incentives for this project anymore anyway.

The project managed to achieve its goals, as participants' overall satisfaction reaches 95.7%. Besides carrying on an ever-shifting project, a noticeable change of attitude appeared among participants, as most of them, nowadays, have become quite extroverted, gladly sharing materials and not feeling exposed to express themselves on platforms, reach out to other people for help and showcase their work. In addition, as the participants were high-profile, well-educated professionals, they not only tried new strategies and tools, but are also very eager to do research on the field of ICT in EE and explore new methods of teaching, included augmented reality, robotics or even drones.

Of course, these changes did not come without significant doubts over teachers' abilities and students' responses; many teachers were stressed over growing a garden, maintaining students' interest by constantly coming up with engaging tasks and evaluating the project. Colleagues and parents expressed concern in relation to how ICT and EE can be combined and feared that new technologies are overtaking all activities children do, thus alienating them from the natural environment, social interactions, etc. Still, over time most barriers have been successfully overcome, as teachers feel more empowered to defend their work and gradually shifted from the traditional teaching and grading process to more flexible, creative and up-to-date practices.

A key aspect of the project discussed off-the-record among members, but not yet researched, involves the ways in which ICT pedagogical use in EE has feasible, measurable effects on students. Throughout the project, facilitators and teachers-participants were brought together, felt inspired, collaborated extensively, created pedagogical material, made friends, and were transformed as people. But there is a lack of research on what happened with students. Of course, teachers observed students' keen interest to engage in school gardening and work with ICT tools. Some students started their own herbal

businesses at school (producing, packaging and selling their own products). Others called for more ICT clubs within Experimental Schools or started taking part in robotics, coding summer schools and contests. But remaining unanswered is what knowledge students exactly acquired from participating in this project and the degree and fields in which they really benefited from it.

Finally, though most stakeholders enjoyed the combination of the digital and the physical outdoor world and made fruitful use of both, what remains to be seen is whether this experiment has indeed contributed towards a long-lasting environmental awareness and an actual transformative shift towards the protection of the environment and the need to pursue sustainability goals.

Conclusion

The need to make the best out of the physical world around us and make good use of the digital tools we are deluged with was the main incentive of this project. Following the flexible ever-changing era we all live in, the project has managed to gain and retain the interest of hundreds of people involved, by having a dynamic structure and content, open to suggestions, ideas and new challenges. Throughout its stages, a noticeable shift of attitude towards ICT in EE, environmental awareness and soft skills has occurred, encouraging all stakeholders to continue coming up with new ideas, proposing new events and partnerships and maintaining a network of innovative professionals who willingly interact and engage in collaborative projects.

References

- Aivazidis, C., Lazaridou, M., & Gustav, F. H. (2006). A comparison between a traditional and an online environmental educational program. *The Journal of Environmental Education*, 37(4), 45-54.
- Arbaugh, J. B., & Benbunan-Fich, R. (2007). The importance of participant interaction in online environments. *Decision Support Systems*, 43(3), 853–865.
- Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*, 8(1), 136-155.
- Carvahlo de Sousa, A., Sevilla-Pavon, A., & Seiz-Ortiz, R. (2012). Autonomy and ICT in environmental education. *Procedia-Social and Behavioral Sciences*, 46, 1343-1347.
- Chatzisavvidis, S., & Alexiou, M. (2012). *Methodology and educational scenarios development process in Language courses*. Thessaloniki, Greece: Center for the Greek Language (in Greek).
- Coventry, M. (2008). Engaging gender: Student application of theory through digital storytelling. *Arts and Humanities in Higher Education*, 7(2), 205-219.
- Cross, P. (1981). *Adults as learners: Increasing participation and facilitating learning*. San Francisco, CA: Jossey-Bass Publishers.

- Fauville, G., Lantz-Andersson, A., & Säljö, R. (2014). ICT tools in environmental education: reviewing two newcomers to schools. *Environmental Education Journal*, 20(2), 248-283.
- Gkountouma, M. (2014). The profile of the adult learner and the factors that promote participation in Civil Academy in Greece. In F. Uslu (Ed.), *INTCESS14-International Conference on Education and Social Sciences Abstracts and Proceedings* (pp. 910-919). Istanbul, Turkey: International Organization Center of Academic Research.
- Gkountouma, M., & Kouklatzidou, M. (2013, October). *E-class and Web 2.0 tools: Designing an environmental project for primary education students*. Paper presented at the IX EUTIC 2013 Global Networks and Public & Corporate Engagement in a Dynamic Environment, Waterford Institute of Technology, Ireland.
- Gkountouma, M., & Kouklatzidou, M. (2015). *Handbook on school gardens: A distance teacher-training course*. Thessaloniki, Greece: 3rd Experimental School of Evosmos.
- Houle, C.O. (1961). *The inquiring mind*. Madison, WI: University of Wisconsin Press.
- Jimoyiannis, A. (2010). Integrating Web 2.0 in education: Towards a framework for pedagogy 2.0. In R. Hackney & C. Evans (Eds.), *Web 2.0 Conference abstracts* (p. 5). London, United Kingdom: Brunel University.
- Kelpanidis, M., & Vrynioti, K. (2012). *Lifelong learning: Social prerequisites and functions: Facts and conclusions*. Thessaloniki, Greece: Zygos.
- Kouklatzidou, M., & Gkountouma, M. (Eds.). (2017). *Activity book: A guide to school gardening* (Manuscript in preparation).
- McLoughlin, C., & Lee, M. J. W. (2010). Personalised and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, 26(1), 28-43.
- Maslow, A. H. (1947). A theory of human motivation. *Psychological review*, 50(4), 370-396.
- Miller, H. L. (1967). *Participation of adults in education: A force-field analysis*. Boston, MA: Center for the Study of Liberal Education for Adult, Boston University.
- Payne, P. (2003). The technics of environmental education. *Environmental Education Research*, 9(4), 525-541.
- Prensky, M. (2001). *Digital game-based learning*. New York, NY: McGraw-Hill.
- Redecker, C. (2009). *Review of learning 2.0 practices: Study on the impact of Web 2.0 innovations on education and training in Europe*. Seville, Spain: Joint Research Center-Institute for Prospective Technological Studies.
- Rubenson, K. (2007). Adult learning in Canada in an international perspective. In L. Servage & T. Fenwick (Eds.), *Learning in Community: Proceedings of the Joint International Conference of the 48th Adult Education Research Conference and the 26th Canadian Association for the Study of Adult Education Conference* (pp. 529-534). Halifax, Nova Scotia, Canada: Mount St. Vincent University.

- Willis, J. M., & Weiser, B. (2005). Technology and environmental education: An integrated curriculum. *Applied Environmental Education & Communication*, 4(4), 297-303.
- Willis, J. M., Weiser, B., & Smith, D. (2016). Increasing teacher confidence in teaching and technology use through vicarious experiences within an environmental education context. *Applied Environmental Education & Communication*, 15(3), 199-213.

Author Details

Maria Gkountouma
gkountouma@yahoo.com

Maria Kouklatzidou
mkouklatzidou@yahoo.gr